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FOR
9·2-inch B.L. Howitzer, Mark II,
CARRIAGE, SIEGE, MARK II.

ISSUED BY THE GENERAL STAFF.

OCTOBER, 1920.



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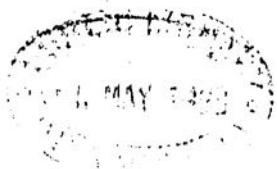


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GENERAL INSTRUCTIONS.

Practical instruction in the equipment should be given to each recruit before any attempt is made to instruct him in gun drill. This instruction should take the form of demonstrations dealing with the work of each number in the detachment; and all men under instruction should, in turn, carry out the work of each particular number.

Instruction in gun drill should begin as soon as they are conversant with all parts of the equipment, and can handle in the best and quickest manner each of the working parts of the gun. Once the work of each number has been thoroughly mastered, it should not take long for the recruit to learn the actual drill.

It is most important that a marked distinction should be drawn between instruction and drill.

During the former the language used should be as simple as possible, and the meaning of all technical terms which are necessary must be carefully explained. A conversational tone should be adopted and under no circumstances whatever should anything in the nature of long quotations from drill books be allowed. The men should be permitted to assume an easy attitude and their interest should not be allowed to flag. They should be encouraged to ask questions.

At drill, on the contrary, rigid discipline must be maintained, orders must be clear and decisive and the detachments made to work steadily, smartly and rapidly. At the same time

the utmost accuracy is essential and any deviations from the methods laid down must at once be checked.

Nomenclature of loads.

The gun and carriage are divided into three loads which are called by the following names :—

Load.	Drill book name.
Carriage bed.	Bed.
Carriage body with cradle.	Carriage.
Gun.	Gun.

CHAPTER I.—GENERAL DUTIES.

This chapter summarizes the duties of each individual number in the detachment. It is only intended as a guide to the instructor, who should use his own words in explaining the various duties to the men.

The detachment is composed of fourteen numbers. The service of the gun is divided between them as follows :—

1	...	...	...	...	in command.
1 and 3...	...	...	...	...	the sights.
2 and 5...	...	...	...	...	the breech.
4	...	...	...	...	the quick elevating gear.
6 and 14	...	...	...	...	the cartridges.
7 and 8...	...	...	...	...	the loading derrick.
9, 10, 11, 12 and 13...	...	...	...	...	the shell.

The duties of each individual number are as follows :—

No. 1.

1. He COMMANDS and is responsible for the entire service of his gun.
2. He gives the WORDS OF COMMAND detailed for him in Chapter II, and repeats all ORDERS affecting his detachment which have not been heard by the numbers concerned. His orders must be given clearly, but no louder than is necessary to enable his detachment to hear.

(B 15204)

A 3

He assists in passing orders down the battery when necessary.

He acknowledges orders by saluting. He must salute correctly, and face so that his salute can be clearly seen.

3. He is responsible :—

- (i) That the BUFFER is properly filled, that there is no leakage at the stuffing box, that the buffer is firmly nutted up to the lug of the gun, and the piston rod to the front of the cradle.
- (ii) That the RECUPERATOR is correctly charged with liquid and air, that there is no leakage at the stuffing boxes and glands, and that the ram is secured to the crosshead of the gun. He sees that the tail rod indicator reads between 0 and 8 pints.
- (iii) That the ACTUATING GEAR of the piston rod is properly assembled.
- (iv) That the SIGHTS are tested. This is done under the supervision of the section commander.

4. At preparation for action he places the WATKIN CLINOMETER over his right shoulder, and procures the ADAPTER, PRESSURE GAUGE, buffer and recuperator SPANNERS and a piece of CHALK.

5. As soon as the gun is in action he ascertains the lowest elevation at which the trajectory will CLEAR THE CREST. He reports this elevation to the section commander.

6. He selects the auxiliary aiming point and records in chalk on the rear face of the earth box the ZERO LINE angles from the auxiliary aiming point and battery picket. The auxiliary aiming point and battery picket must not be on the right of

the gun; the best position is about 60 degrees right or 120 degrees left of the zero line.

7. He assists 3 to lay for line by looking along the FINDER of the DIAL SIGHT when the aiming point is to the rear.

8. (i) At INDIRECT LAYING with ELEVATION INDICATOR, he lays for elevation. He sets the elevation indicator at the elevation ordered and lays by bringing the longitudinal bubble to the centre of its run.

(ii) At INDIRECT LAYING with WATKIN CLINOMETER, he applies the index correction (if any) of his clinometer to the elevation ordered, sets the clinometer, and directs 3 to elevate and depress until the bubble of the Watkin clinometer is in the centre of its run.

(iii) At DIRECT LAYING he sets the elevation indicator at the elevation ordered.

9. (i) When SETTING the ELEVATION INDICATOR he turns the top of the elevation indicator handwheel towards himself last, to take up backlash.

(ii) When using the WATKIN CLINOMETER he sees that the clinometer plane and the base of the clinometer are free from grit or dirt, and that the clinometer is placed exactly in the same position on the plane for each lay.

(iii) When LAYING he depresses last (top of the handwheel towards the muzzle) with at least two complete turns of the handwheel. If the bubble of the clinometer over-runs the centre he rapidly gives the elevating wheel two complete turns of

elevation followed by $1\frac{1}{2}$ turns of depression before completing the lay.

10. He supervises the preparation and supply of AMMUNITION. As time fuzes deteriorate rapidly when unprotected from damp, only such as are required for immediate use will be uncovered. When one group of ammunition is nearly expended, he reports particulars of the next group to be used.

11. He supervises LOADING.

The shell should be rammed home vigorously with a good travel. The sound of the driving band engaging the rifling should be distinctly heard. Irregularity in ramming causes irregular shooting, especially when the gun is worn. An improperly rammed shell may slip back when the gun is elevated and cause a premature.

He sees that the correct charge is loaded.

12. He gives the order to FIRE. The gun will on no account be fired without his order. Before giving this order he sees that the red lines on the breech and breech screw coincide, showing that the breech is properly closed, and that the gun is in all respects ready.

13. He is responsible that the INTERVAL between rounds is properly kept as regards his own gun. When a salvo or quick rate of battery fire (less than 5 seconds interval) is ordered, he extends his right arm above his head as soon as his gun is ready to fire.

14. At intervals he checks the LENGTH OF RECOIL. He compares the elevation given by the recoil indicator with the elevation on the elevation indicator.

15. As soon as his gun has fired he gives the order to LOAD if the battery commander's orders indicate that this is his intention.

16. When RAPID or PROLONGED FIRING takes place he takes every opportunity of attending to his equipment. The chamber, mushroom head and breech block should constantly be sponged with water. If the gun is hot, the bore should be cooled with water when "Stand easy" is ordered.

No. 2.

1. He works the BREECH MECHANISM and FIRES the gun. He is responsible for the breech and muzzle COVERS. With 5 he tests and adjusts the OBTURATING PAD. He assists 5, 11 and 12 to RAM.

2. At preparation for action :—

(i) He straps the TUBE POCKET round his waist and fills it with tubes.

(ii) He places the LANYARD round his neck and tucks the ends into his belt.

(iii) He procures the VENT BIT, RIMER, OIL CAN and breech mechanism WRENCHES.

3. (i) To OPEN the BREECH :—He takes hold of the lever breech mechanism with the left hand, thumb uppermost, and slides the hand down so as to press down the catch retaining, at the same time pulling the lever to the rear and then swinging it round to the right as far as it will go.

(ii) To CLOSE the BREECH :—The above procedure is reversed. The breech must on no account be slammed.

4. He assists 5, 11 and 12 to RAM. The shell is rammed home as follows :—

As soon as the shell has been brought into position by the derrick, 2 and 5 step on to the loading platform; 12 hands the rammer to 2 and 5; 5 steadies the head of the rammer against the base of the shell (at drill, against the face of the breech), and, at the order "Half way," 2 and 5 push the shell forward until the base is 6 inches inside the face of the breech.

11 and 12 step on to the loading platform in rear of 5 and 2, and the four numbers reach out and grasp the rammer as far to the rear as convenient, inner hands back up and outer hands back down, facing the rear. 1 orders "Home" and the shell is rammed home with full force.

5. At the order "READY," he passes the loop of the firing wedge over the striker cap and pulls it towards him until the cap passes the projections on the wedge. He stands on the firing platform facing the front. He holds the toggle in his right hand and grasps the centre of the lanyard with his left hand.

6. At the order "FIRE," he jerks the lanyard smartly. The gun will on no account be fired without the order from 1.

7. He oils and cleans the BREECH MECHANISM when necessary during firing.

No. 3.

1. He LAYS and is responsible for the SIGHT COVER. He directs 6 when planting AIMING POSTS. He assists 1 to test the SIGHTS.

2. At preparation for action he places the No. 7 DIAL SIGHT and carrier in its bracket, and procures a piece of CHALK.
3. (i) He always LAYS for LINE. He sets on the dial sight the aiming point angle and all deflections ordered, and CROSS LEVELS the sight. He lays on the left edge of the aiming point unless otherwise ordered.
(ii) At INDIRECT LAYING with WATKIN CLINOMETER he sets the elevation indicator at the elevation ordered and elevates and depresses under the orders of 1.
(iii) At DIRECT LAYING he lays both for line and for elevation over the open sights.
4. (i) When setting the dial sight by means of the QUICK RELEASE he moves the micrometer head through one complete turn to ensure that the teeth have re-engaged correctly.
(ii) When SETTING a right deflection on the dial sight he turns the right micrometer head away from him with his right hand; when setting a left deflection he turns the left micrometer head towards himself with his left hand.
(iii) When READING a left angle on the dial plate he reads the minutes off the left micrometer scale; when reading a right angle he reads the minutes off the right micrometer scale.
(iv) When LAYING for LINE he turns the top of the traversing handwheel to the left last.

5. CROSSHEADS are fitted to aiming posts to compensate for lateral movement of the sight. Both crossheads have similar markings and numbers. He notes which corresponding pair of markings are in line and uses them to lay on. He directs 6 to clamp the crossheads low down, so that the bottom of the far one is just visible over the top of the near one.

6. He records in chalk on the buffer cylinder the PRESENT TARGET angle from the auxiliary aiming point, battery picket, or aiming posts.

7. The following are the signals used by 3 when directing 6 to plant aiming posts :—

SIGNAL.	MEANING.
Right arm extended to the right or left arm extended to the left.	Move in the direction indicated.
Arm dropped	Halt.
Both arms dropped sharply from above the head.	Plant.
Upward or downward motion of the arms with both arms extended laterally.	Raise or lower the crosshead.
Both arms extended above the head and moved laterally in the required direction.	Move head of post in the direction indicated.
Both arms extended sharply upwards.	Pick up.
Both arms extended to the front...	Move to plant the far aiming post.
Body turned about and both arms extended to the rear.	Come in.

No. 4.

1. He works the QUICK ELEVATING GEAR.
2. At preparation for action he procures a McMahon SPANNER, and places the RAMMER one yard to the right of the loading platform, head in line with the front edge.
3. (i) To bring the gun to the LOADING POSITION he releases the locking pin by depressing the pedal with his left foot, and depresses the gun by means of the quick elevating handwheel.
 (ii) To bring the gun to the FIRING POSITION he removes his foot from the pedal and elevates the gun by means of the quick elevating handwheel until the nut of the actuating rod clicks home, showing that the locking pin has engaged.
 (iii) When elevating or depressing by means of the QUICK ELEVATING HANDWHEEL he must take care to bring the gun to rest gently.
4. While the gun is being LOADED he retains the gun in the loading position by holding the quick elevating hand-wheel.

No. 5.

1. He is responsible for the BREECH and CHAMBER, and assists 2 to test and adjust the OBTURATING PAD. He assists 2, 11 and 12 to RAM.
2. At preparation for action he places TALLOW and WASTE in a convenient position.
3. He receives CARTRIDGES from 6 and loads them. He places the cartridge in the chamber so that the igniter

faces the vent and is just clear of the mushroom head. If the cartridge is thrown to the front of the chamber, either by 6 or by the closing of the breech screw, a missfire may occur.

No. 6.

1. He plants AIMING POSTS and prepares and carries CARTRIDGES.
2. At preparation for action he places the AIMING POSTS, with crossheads clamped, on the right of the carriage, one yard clear and heads to the front.
3. He assists 14 to prepare CARTRIDGES and carries them to the gun. He holds the cartridge with the charge number upwards for 1 to check, but in wet weather he must keep the igniter dry. After 1 has checked the charge, he hands the cartridge to 5, igniter to the left.

No. 7.

1. He works the DERRICK.
2. At preparation for action he places the WINCH HANDLE in position and examines and lubricates the DERRICK.
3. He assists 8 to work the DERRICK, 7 working in front and 8 in rear of the handle. As soon as the loading tray is in position on the loading platform, 7 and 8 lower the derrick until the clips can be engaged. At the order "Raise" 7 and 8 raise the shell into the loading position, working slowly for the first two turns of the winch handle. 7 holds the winch handle while the shell is rammed home. After ramming he lowers the derrick for the loading tray to be removed and then raises it through an angle of 30 degrees.

No. 8.

1. He assists **7** to work the DERRICK.

No. 9.

1. He prepares SHELL, and with **10**, **11** and **12** carries them to the gun.
2. At preparation for action he puts a FUZE KEY into his pocket and places the lanyard round his neck.
3. He assists **10** to remove the SHELL BEARER.

No. 10.

1. He prepares SHELL and with **9**, **11** and **12** carries them to the gun.
2. At preparation for action he places the SHELL BEARER with the shell.
3. He assists **9** to remove the SHELL BEARER.

No. 11.

1. He prepares SHELL and with **9**, **10** and **12** carries them to the gun. He assists **2**, **5** and **12** to RAM.
2. At preparation for action he puts a FUZE KEY into his pocket, placing the lanyard round his neck, and places a LOADING TRAY with the shell.
3. He UNCAPS FUZES. On removing the cap of a No. 106 fuze he sees that the tape is correctly wound and that the ends of the shearing wire are visible.
4. After loading he removes the LOADING TRAY.

No. 12.

1. He prepares SHELL and with 9, 10 and 11 carries them to the gun. He assists 2, 5 and 11 to RAM.
2. At preparation for action he places a LOADING TRAY with the shell.
3. He hands the RAMMER to 2 and 5 and replaces it after ramming.

No. 13.

1. He is responsible for the preparation and supply of TUBES and SHELL.
2. At preparation for action :—
 - (i) He puts a FUZE KEY into his pocket and places the lanyard round his neck.
 - (ii) He procures a BRUSH, HAMMER and FILE.
3. He sees that shell are :—
 - (i) Scrupulously CLEAN, especially the driving bands. Brushes and water should be used if necessary.
 - (ii) SORTED into groups by nature, driving band and weight.
 - (iii) STORED standing up on clean planks.
 - (iv) FUZED as ordered and protected from damp.
 - (v) ISSUED from the group ordered.
4. When using No. 106 fuzes :—
 - (i) He BREAKS the wire and seal on issuing the round.
 - (ii) He DISCARDS any fuze of which the wire and seal are already broken or the cap deficient, and sees that on no account is it replaced in wagon or lorry.

5. When one group of shell is nearly expended, he REPORTS to 1 the particulars of the next group.

No. 14 OR COVERER.

1. He is SECOND IN COMMAND of the detachment and is responsible for the preparation and supply of CARTRIDGES.

2. At preparation for action he procures a SCREW DRIVER.

3. He sees that cartridges are :—

- (i) SORTED by nature of propellant and "group" number.
- (ii) STORED in cylinders or boxes and protected from extremes of temperature and from damp.
- (iii) PREPARED correctly ; all sections bearing a higher number than the charge ordered are removed.
- (iv) ISSUED from the group ordered.

4. When one group of cartridges is nearly expended, he REPORTS to 1 the particulars of the next group.

CHAPTER II.—GUN DRILL.

Artillery Training lays down the principles of battery tactics, which vary little with different equipments. This Chapter details the orders given and the procedure by which these orders are carried out in batteries armed with the 9·2-inch Howitzer.

The wording must be memorized and strictly adhered to, with the exceptions of sections 30 and 31.

The executive order is shown throughout as being given by the section commander, as will normally be the case during training. When orders can be heard throughout the battery they will be acted upon without repetition. Instructors will invariably employ the orders detailed for the section commander, even when drilling a single detachment.

1. POSITIONS AT DETACHMENT REAR.

The detachment falls in two deep, one pace between ranks, **1** on the right and **14** on the left of the front rank. **1** and **14** are not covered.

When the gun is limbered up, the front rank is three paces in rear of the carriage, **1** covering the off wheel.

When the gun is in action, the front rank is one pace in rear of the loading platform, **1** covering the right trunnion.

2. TO TELL OFF.

Section commander.

“... section—Tell off.”

1 numbers himself **1**, the right hand man of the rear rank **2**, his front rank man **3**, and so on.

3. TO CHANGE ROUND.

Section commander.

"... section—*Change round.*"

1 takes a pace to the rear with his right foot and a pace to the left with his left. The left hand man of the rear rank takes a pace to the left with his left foot and a pace to the front with his right. At the same time the remainder of the front rank take a pace to the right and the rear rank a pace to the left.

(The detachment is then again told off.)

4. TO LAY THE HOLDFAST PLATFORM.

The platform is laid by two detachments under the supervision of the section commander.

The platform is brought up on lorries and halted in rear of the position.

The following stores are brought up:—

Director	...	...	1	Picks	...	...	...	6
Tape, 100 feet	...	...	1	Shovels	...	...	...	6
Field level	...	...	1	Spades...	...	...	...	6
Aiming posts	...	...	3	Rammers, earth	...	...	...	4
Dragropes, heavy, pairs	...	2	Maul	...	...	...	...	1
Handspikes	...	6	Hammer	...	...	...	...	1
Planks, 10 feet	...	2	Crowbars	...	...	...	...	2
Rollers, 3-ft. by 6-in.	...	2	Spanner, MacMahon...	...	...	...	...	1
Tarpaulin	...	1	Lashing, 1½ inch.	...	...	...	...
Tracing tape.				Mineral jelly and waste.				

The tarpaulin is laid out clear of the position and stores are arranged on it.

The section commander lays out the centre line of the platform and traces the trenches.

The trenches are dug to the required depth and levelled in all directions; they should be kept as closely as possible to the dimensions traced.

The platform is unloaded from the lorries. It consists of the following parts:—

2 diagonal beams (right and left).	15 planks.
2 longitudinal beams (right and left).	8 pegs, securing bed.
1 cross beam.	4 holding down bolts.
1 skid, cross beam.	2 wheel guides.
2 tie rods (one long and one short).	5 bolts, various.

NOTE.—The holes in the longitudinal beams for the holding down bolts must be stopped up with oily waste to prevent mud from getting in.

The bolts securing are put into position in the diagonal beams, and the beams are lowered into their trenches and secured together at the front end.

The skid, cross beam is lowered into its trench.

The diagonal beams and skid are tested for level and position and adjusted if necessary. The three angle irons must be in alignment.

The ten lower planks are placed in their trench in front of the diagonal beams.

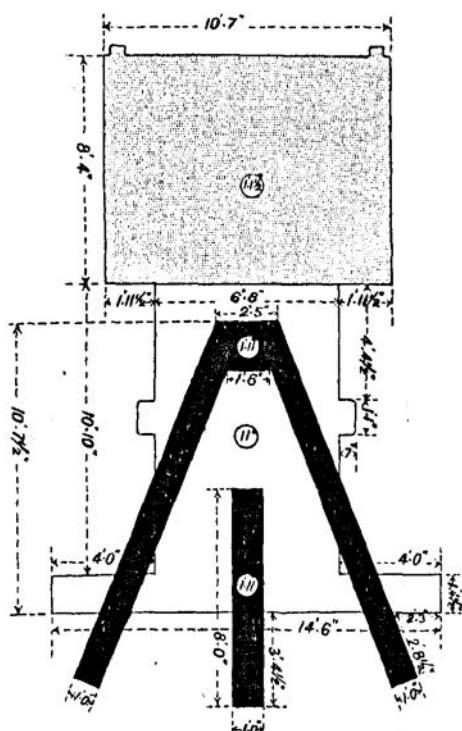
The cross beam is lowered into position over the diagonal beams and skid, its rear face butting against the angle irons, and is nutted up to the bolts of the diagonal beams.

The longitudinal beams are lowered into their trenches and pinned to the cross beam; the two tie rods are connected.

The longitudinal beams and cross beam are tested for level and adjusted if necessary.

To face page 20.

DIAGRAM.
EXCAVATION FOR HOLDFAST PLATFORM.



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Malby & Sons, Lith.

The five upper planks and the pegs securing bed are placed clear on the right front of the platform.

The earth is rammed well round the outside of the beams flush with their tops.

The wheel guides are pinned to the bed peg sockets and two 10 feet planks are sunk in the ground in rear of the cross beam and in prolongation of the wheel guides.

5. TO MOUNT THE GUN.

The gun is mounted by two detachments under the supervision of the section commander.

"A" detachment does the work of mounting and assembling the gun and "B" detachment the moving of loads, digging, &c. Even numbers work on the right and odd numbers on the left.

The gun and mounting on the three transporting carriages is halted in rear of the platform, and the engine draught connectors are unpinned.

The following stores are brought up:—

Picks	...	...	2	Levers, ratchet	...	...	3
Shovels	...	...	4	Screws, raising	...	...	3
Scotches	...	...	8	Raising jacks and tommies	...	...	2
Tarpaulin	...	1	1	Winch handles	...	...	4
Rammers, earth			2	Bolts, securing carriage body			
Crowbars	...	2		to rear roller path	...	4	
Handspikes	...	2		Holding down bolts	...	4	
Maul	...	1		Ramping pieces	...	...	3
Hammer, rawhide	1			Monkeys and bars	...	...	2
" claw,				Broom, bass	...	...	1
" 32-oz.	1			Oil can	...	...	1
Dragropes, heavy,				Spanners, various.			
pairs	2			Mineral jelly and waste.			

(B 15204) A 5

The tarpaulin is laid out on the right of the platform and the stores are arranged on it.

The bed.

"B" detachment remove the earth box, platforms and derrick from the top of the bed and place them clear on the right front of the platform.

"A" detachment fix dragropes and haul the bed into position over the platform.

When it is in position the numbers take post as follows :—

1 and **14** attend to the holding down bolts.

2 and **4** at the right front raising screw.

3 and **5** at the left front raising screw.

6 and **7** at the rear raising screw.

8, 9, 10 and **11** at the lock of the transporting limber.

12 and **13** apply two handspikes to the locking plate from the front and assist in holding up the lock.

1 and **14** remove the waste from the holes in the longitudinal beams.

2, 3, 4, 5, 6 and **7** fix the lifting screws and ratchet levers, take the weight of the bed and remove the locking pins.

8 shifts the lever steering pin to the "Rigid" position.

2, 3, 4, 5, 6 and **7** lower the bed evenly on to the beams.

1 and **14** screw up the holding down bolts.

2, 3, 4, 5, 6 and **7** disconnect and remove the raising screws and ratchet levers.

10 and **11** fold back the wings of the traversing arc.

8 and **9** remove the travelling crosshead and replace the nut.

"B" detachment remove the wheels, odd numbers the front wheels, even numbers the rear wheels.

The carriage.

Both detachments haul the carriage into position over the bed.

"A" detachment take post as follows:—

- 1** supervising the jacks.
- 2** and **4** at the right jack.
- 3** and **5** at the left jack.
- 6** and **12** at the right raising screw.
- 7** and **13** at the left raising screw.
- 8, 9, 10** and **11** at the lock of the transporting limber.
- 14** supervising the raising screws.

"B" detachment haul the gun in rear of the carriage.

2, 3, 4 and **5** place the jacks under the front end of the carriage and take the weight.

8 shifts the lever steering pin to the "Rigid" position.

6, 7, 12 and **13** fix the ratchet levers, take the weight and remove the travelling screws.

1 opens the axle brackets and removes the plug, axletree pivot; odd numbers of "B" detachment remove the wheels and axle.

As soon as the wheels and axle are clear the earth box is erected and filled by "B" detachment.

The carriage is lowered evenly by means of the jacks and lifting screws.

1 nuts up the bolts securing carriage body to pivot block.

14 screws up the bolts securing carriage body to rear roller path.

2 and **3** remove the jacks; **12** and **13** remove the ratchet levers.

4 connects the pedal of the quick elevating gear to the bed.

5 unlocks the travelling lock of the pivot block and fixes the rear laying platform.

6 unpins the link connecting cradle.

7 engages the pinion of the traversing rack.

Even numbers of "B" detachment remove the rear wheels.

The gun.

"B" detachment drive in the pegs securing bed and place in position the five upper planks. They continue filling the earth box and pile filled sand bags on top of the upper planks.

4 and **5** of "A" detachment remove the rope securing gun and release the gun stops.

1 removes the pin travelling lock.

6 and **7** house the brakes.

"A" detachment hauls the gun to the front until the guide rollers engage the bottom of the carriage ramps, **3** traversing the carriage and **7** traversing the gun as necessary.

"A" detachment takes post as follows:—

1 supervising.

2 under the transporting wagon.

3 on his laying platform.

4 and **5** at the guide brackets.

6 and **7** at the tie ropes.

8 and **10** at the winding up gear on the right side.

9 and **11** at the winding up gear on the left side.

12 and **13** at the front wheels.

14 sitting astride the buffer.

2 releases the strut.

8, **9**, **10** and **11** fix the winch handles to the lower spindle.

8, 9, 10 and **11** work the winch handles so that the tie ropes move forward ; **6** and **7** secure the tie ropes to the carriage body.

8, 9, 10 and **11** work the winch handles in the opposite direction and move the transporting wagon forward until the guide rollers reach the ends of the carriage ramps, **2** guiding the strut into the thrust bar.

NOTE.—If the ground slopes upwards from the rear of the platform, **6** and **7** must place ramping pieces in the carriage ramps and **2** a ramping piece under the thrust bar.

8, 9, 10 and **11** shift the winch handles to the upper spindle.

14 removes the buffer nut.

3 elevates the cradle until it is in prolongation of the gun.

8, 9, 10 and **11** work the winch handles until the guides of the gun are about to enter the guide ways of the cradle.

3 adjusts the cradle so that the clearance on top of the guides is about twice that underneath the guides ; **4** and **5** oil the guides and remove the pins of the guide brackets.

8, 9, 10 and **11** continue working the winch handles ; as soon as the cradle takes the weight of the gun, **4** and **5** withdraw the guide brackets.

When the gun is home :—

14 replaces the buffer nut, inserts the split pin and removes the buffer locking pin.

1 inserts the recuperator cotter and split pin and screws up the beating face.

12 and **13** remove the apparatus securing recuperator ram.

8, 9, 10 and **11** shift the winch handles to the lower spindle.

4 disconnects the hauling chain.

8, 9, 10 and **11** run back the wagon.

6 and **7** disconnect the tie ropes from the carriage and connect them to the wagon.

2 secures the strut.

"B" detachment remove the wagon.

The fittings.

1 and **3** fix 1's platform.

2 and **4** fix 2's platform.

5 fixes his platform.

7, **8** and **9** mount the loading derrick.

10 and **11** swing the wings of the traversing arc into position and bolt them.

6, **12**, **13** and **14** fix the loading platform and secure the thrust bar to it.

6. TO PREPARE FOR ACTION.

Preparation for action will be carried out as soon as the gun has been mounted. When in action, advantage should be taken of any interval to examine, test and arrange equipment.

Section commander.

"...section—*Prepare for action.*"

Each number procures the stores detailed in Chapter I.

1 tests the clinometer and the elevation indicator, and sees that the boro is clear, the buffer full and the recuperator correctly charged both with liquid and air; he satisfies himself that the detachment and equipment are in all respects ready for action.

2 removes the breech and muzzle covers, and examines the breech mechanism.

3 removes the sight cover and examines and tests the sights with the assistance of **1**. He then examines the elevating and traversing gears.

4 examines and tests the quick elevating gear.

5 examines the chamber and threads of the breech.

7 and **8** examine and test the derrick.

The remaining numbers examine and prepare ammunition.

As soon as he has completed his duties, each man takes up his position in action. **1** collects reports and reports to his section commander "No. ..., ready for action" or otherwise.

7. POSITIONS IN ACTION.

1 where he can best superintend the work of the detachment.

2 on the firing platform on the right of the breech, facing the front.

3 on the laying platform in rear of the dial sight, facing the front.

4 at the quick elevating handwheel, facing the left.

5 on the platform on the left of the breech, facing the right.

6 and **14** with the cartridges.

7 in front of the winch handle, facing the rear.

8 in rear of the winch handle, facing the front.

9, 10, 11, 12 and **13** with the shell.

8. TO FORM DETACHMENT REAR IN ACTION.

Section commander.

"...section—*Detachments rear.*"

1 doubles to his place (one yard in rear of the loading platform and covering the right trunnion) and gives the order "No. ..., double march."

At the order from 1 the remainder double to their places and halt.

9. TO TAKE POST FROM DETACHMENT REAR.

Section commander.

"...section—*Take post.*"

The detachment double to their places by the shortest way and halt.

10. TO OBTAIN THE LINE OF FIRE.

The line of fire is obtained by one of the methods described in Artillery Training.

11. TO LAY THE GUN IN THE LINE OF FIRE.

Section commander.

"...section—*Aiming point ..., ... degs. ... mins. right (or left).*"

1 sets the elevation indicator at 20 degrees and brings the bubble to the centre of its run by the elevating handwheel.

2 closes the breech.

4 brings the gun to the firing position.

3 sets the dial sight, brings the cross level bubble approximately to the centre of its run and lays accurately for line with the traversing handwheel.

3 reports to 1 the readings of the dial sight from the battery picket and auxiliary aiming point; 1 records them on the rear face of the earth box.

4 brings the gun to the loading position.

2 opens the breech.

The section commander goes to his guns and takes a note of the angles recorded.

12. TO ASCERTAIN THE LOWEST ELEVATION AT WHICH THE TRAJECTORY WILL CLEAR THE CREST.

When the crest is within 100 yards of the gun.

The angle of sight to the crest is the elevation required.

1 lays the gun just clear of the crest by looking along the bottom of the bore and ordering 3 to elevate or depress as required. He then brings the bubble to the centre of its run by turning the elevation indicator handwheel, and reports the reading of the elevation indicator to the section commander.

When the crest is over 100 yards from the gun.

The procedure is the same, but an allowance is made for the elevation due to the range to the crest.

1 proceeds as before. The section commander makes a liberal estimate of the range to the crest and adds the elevation for this range (with first charge unless otherwise ordered) to the elevation reported by 1.

13. TO PLANT AIMING POSTS.

Section commander.

"... section—*Aiming posts front (or rear).*"

2 closes the breech and **4** brings the gun to the firing position.

6 doubles to the front (or rear) of his gun with two aiming posts and plants them as directed by **3** in line with the dial sight set at zero (or 180 degrees). He plants the near post first at about 50 yards from the gun. He then plants the further post as far from the gun as possible up to about 100 yards.

4 returns the gun to the loading position.

If the order "Replant aiming posts" is given, **6** doubles out and, at the signal from **3**, pulls up the posts, the further one first, and replants them.

14. PARALLEL LINES TO A NAMED GUN.

Section commander.

"... section (or No. ...)—*Parallel lines to No. ...*"

3 of the named gun re-lays for line, all guns being roughly laid at 20 degrees.

Zero line method.

1 of the named gun reports his angle right or left of his zero line. This angle is ordered to the other guns.

Aiming point method.

The section commander indicates an aiming point.

3 of the named gun swings his dial sight on to the aiming point and **1** reports the reading. This angle, corrected if necessary for parallelism, is ordered to the other guns.

Director method.

3 of the named gun swings his dial sight on to the director and **1** reports the reading. The director is set accordingly and individual angles are ordered to the other guns.

The other guns are then laid in the line of fire as already detailed.

15. TO CHECK PARALLEL LINES.

Section commander.

"... section—Check parallel lines to No. ..."

1 sets the elevation indicator at 20 degrees and brings the bubble to the centre of its run.

2 closes the breech and **4** brings the gun to the firing position.

3 holds an aiming post over the dial sight.

3 of the named gun lays on the dial sight of each gun in turn.

1 reports the angles to his section commander, who passes them to the section commanders concerned.

3 of each other gun lays on the dial sight of the named gun.

1 reports the reading to his section commander, who checks it with the angle taken by the named gun. The sum of the two angles should be 180 degrees. If necessary he corrects the zero line angles.

16. TO LOAD.

Section commander.

"... section—(shell) ..., (fuze) ..., (propellant) ..., Charge ... "

1 repeats this order and at the correct moment orders "Load."

13 issues a shell; **9, 10, 11** and **12** carry the shell on the loading tray to the gun, **12** and **10** on the right, **11** and **9** on the left, **12** and **11** in front, and slide the tray into its guides on the loading platform.

9 and **10** remove the bearer; **11** uncaps the fuze (if necessary).

7 and **8** lower the derrick; **11** and **12** engage the clips with the loading tray.

12 orders "Raise"; **7** and **8** raise the shell into the loading position.

12 supplies the rammer; **2** and **5** take post on the rammer; **5** steadies the head against the base of the shell; **7** steadies the winch handle.

1 orders "Half way" and the shell is pushed forward until the base is 6 inches inside the face of the breech.

11 and **12** take post on the rammer.

1 orders "Home" and the shell is rammed home.

12 replaces the rammer; **7** lowers the derrick; **11** removes the loading tray; **7** raises the derrick through 30 degrees.

14 issues a cartridge to **6**; **6** carries it to the gun, shows it to **1**, and hands it to **5**; **5** places it in the chamber and reports "In."

2 closes the breech, places a tube in the vent and closes the lock.

4 brings the gun to the firing position.

After the first round, if there is no alteration in ammunition **1** orders "Load," repeating also any change in ammunition which may be ordered. The cartridge will not be loaded sooner than is necessary to maintain the rate of fire.

NOTE.—At drill only wooden shell and drill cartridges will be loaded.

17. TO LAY THE GUN.

Indirect laying with elevation indicator.

Section commander.

"... section —... degs. ... mins. more right (or left),"
"(elevation) ... degs. ... mins."

3 puts on the deflection and **1** sets the elevation indicator.
1 elevates until the bubble runs to the front, depresses until the bubble is nearly in the centre of its run and reports "On" to **3**.

3 cross levels, lays for line and stands clear.
1 completes the lay for elevation.

Indirect laying with Watkin clinometer.

Section commander.

"... section—Clinometer laying,"
"... degs. ... mins. more right (or left),"
"(elevation) ... degs. ... mins."

3 puts on the deflection and sets the elevation indicator.
1 applies the index correction (if any) to the elevation ordered and sets the clinometer.

3 elevates and depresses under the orders of **1** until the bubble is nearly in the centre of its run. **1** reports "On" to **3**.

3 cross levels, lays for line and reports "On" to **1**.

3 depresses steadily until **1** reports "On" a second time.

NOTE.—When laying indirect, the elevation ordered is the actual elevation at which each gun is to be laid.

Direct laying.

Section commander.

"... section—Reference point ..., Target ...,"

"Open sights, ... degs. ... mins. more right (or left),"

"(elevation) ... degs. ... mins."

3 puts on the deflection and **1** sets the elevation indicator.

3 cross levels and lays direct over the open sights on the ground line of his portion of the target.

If "indirect laying" is ordered, **3** swings his dial sight on to the auxiliary aiming point; **1** brings the longitudinal bubble to the centre of its run by means of the elevation indicator handwheel, and reports the new reading of the elevation indicator to his section commander.

18. TO FIRE.

No. **1**.

"No. ... —Ready."

"No. ... —Fire."

1 orders "Ready" when he has satisfied himself that his gun is ready and shortly before it is his turn to fire.

2 attaches the lanyard.

3, 4, and 5 stand to attention facing the front.
When his turn arrives 1 glances at the breech and orders
"Fire."
2 fires the gun and puts the lanyard round his neck.
4 brings the gun to the loading position.
2 opens the breech, ejects the tube and wipes the head of
the vent axial with a wet cloth.
The gun is re-loaded and re-laid.
The gun will on no account be fired without the order from
1.

19. MISSFIRES.

If the gun fails to fire, 2 re-attaches the lanyard and pulls it. If the gun again fails to fire, 2 allows ten seconds to elapse, ejects the tube and examines it.

If the tube has failed to fire he examines the cap. If not fairly struck the lock is changed. If fairly struck a new tube is inserted. This tube is also tried twice; if it fails a second time, a pause of ten seconds is made and the lock is changed.

If the tube has fired a pause of three minutes is made; 1 then depresses the gun with the elevating handwheel until 2 can open the breech; after a further pause of one minute 1 removes and examines the cartridge. If it is dry and serviceable, 1 re-adjusts it in the chamber. If it is damp or smouldering, he places it clear and orders a new cartridge to be loaded.

None of the detachment nor any cartridges should be in rear of the breech when it is opened.

20. TO CHANGE TARGET.

"... section—*Change target,*"
" ... degs. ... mins. more right (or left),"
or
" ... degs. ... mins. right (or left) of zero lines."

If the angle is given as "more right (or left)," 3 sets the dial sight at the recorded present target angle; if the angle is given from zero lines he sets the dial sight at the recorded zero line angle. He then turns the micrometer head of the dial sight through the angle ordered.

1 passes the reading to his section commander who corrects it if necessary.

The procedure is then as in Section 11, "To lay the gun in the line of fire."

21. TO STOP FIRING.

Section commander.

"... section—*Stop.*"

The detachment continue their duties but the gun is not fired until the order "Go on" is given.

22. TO STAND FAST.

Section commander.

"... section—*Stand fast.*"

All stand fast whatever they are doing.
At the order "Go on" work is continued.

23. TO STOP LOADING.

Section commander.

"... section—*Stop loading.*"

The detachment continue their duties. Any gun already loaded is fired at its proper interval, but no gun will be loaded until the order "Go on" is given.

24. TO EMPTY GUNS.

Section commander.

"... section—*Empty guns.*"

Any gun loaded is laid at the last elevation and line and fired. If a safety pin or cap has been removed before the order is given, the loading is completed and the gun fired.

25. TO STAND EASY IN ACTION.

Section commander.

"... section (or No. ...)—*Stand easy.*"

This order is given to indicate that firing is temporarily suspended.

Before opening fire again the order "Take post" will be given.

26. TO CEASE FIRING.

Before "Cease firing" is ordered guns must be empty.

Section commander.

"... section—*Empty guns, Cease firing.*"

The gun is sponged out.

1 brings the gun horizontal and inserts the buffer locking pin.

- 2** closes the breech.
- 3** sets the traversing gear at zero.
- 4** disconnects the pedal of the quick elevating gear and connects it to the carriage.
- 6** brings in the aiming posts if ordered.
- The stores detailed in chapter I are replaced in their boxes.
- The detachment form detachment rear.

27. TO DISMOUNT THE GUN.

The procedure is the reverse of that detailed in section 5.
The pegs securing bed are withdrawn from the ground by inserting first a crowbar and later a handspike under the lip and using it as a lever of the first order with a suitable fulcrum.

28. TO PICK UP THE HOLDFAST PLATFORM.

The procedure is the reverse of that detailed in section 4, the earth being first loosened round the outside of the beams.

29. CASUALTIES TO DETACHMENTS.

Men sent up to replace casualties report to their section commanders who order such changes of duties as they consider necessary.

Casualties are replaced as follows :—

- | | |
|-----------------------|--|
| Section commander ... | By the senior No. 1 of the section. |
| 1 | By a named successor (usually 14). |
| 3 | By a named successor. |
| With thirteen men ... | 12 performs the duties of 12 and 13 . |

With twelve men	... 12 performs the duties of 12 and 13 ; 14 performs the duties of 14 and 6 .
With eleven men	... 12 performs the duties of 12 and 13 ; 14 performs the duties of 14 and 6 ; 8 performs the duties of 8 and 5 .
With ten men	... 12 performs the duties of 12 and 13 ; 14 performs the duties of 14 and 6 ; 8 performs the duties of 8 and 5 ; 4 disappears and 3 brings the gun to the firing and loading positions with the elevating handwheel.

30. DISABLEMENT.

The extent of disablement ordered will depend on the time available and the probability of recapture.

To disable the gun so that it can be brought into action immediately after recapture: Close the breech, remove the carrier hinge bolt and lever breech mechanism.

To disable the gun so that it can be brought into action after repair: Remove the buffer nut and recuperator cotter; fire a round with full charge.

To destroy the gun: Place an H.E. shell in the muzzle; load with H.E. and full charge; fire the gun by means of a long lanyard from under cover. A length of telephone cable attached to the lanyard is suitable for the purpose.

NOTE.—The dial sight and clinometer should always be removed and taken away before abandoning a gun.

31. BLANK AMMUNITION.

- (i) No officer, non-commissioned officer or gunner who has not been trained and passed in gun drill is to command a section or form part of a gun detachment firing blank ammunition at salutes or at training.
- (ii) When firing B.L. blank cartridges, no gun is to be reloaded within 30 seconds after firing. Even after this interval no gun is to be reloaded until the chamber and bore have been sponged out and examined by 1.
- (iii) In the event of a missfire a further attempt should be made to fire the gun in its turn. In no case must the breech be opened for at least one minute with black powder and ten minutes with smokeless charges. No one must be in rear of the breech when it is opened. In firing salutes, an officer or senior non-commissioned officer should be detailed for the special duty of timing the interval after a missfire and informing 1 of that gun when the breech may be opened.

CHAPTER III.—LAYING AND FUZE SETTING TESTS.

1. In every battery there should be at least six qualified layers per subsection, exclusive of serjeants and lance-serjeants. A list of layers should be kept. All layers, section commanders, serjeants and lance-serjeants should be tested periodically.
2. All officers and Nos. 1 must be thoroughly conversant with :—
 - (i) The tests for and care of sighting gear and sights.
 - (ii) The methods of obtaining parallel lines of fire.
 - (iii) The application of gun corrections.
3. Layers will be tested by means of two tests: Test A will consist of four lays indirect, test B of two lays direct.
4. A maximum of 20 marks will be given for each lay in test A, and 10 marks for each lay in test B. In order to qualify a layer must obtain 75 marks.
5. The examiner should be assisted by an officer or senior non-commissioned officer with a stop-watch and record book, and by a penciller who will take down all orders given, for reference when checking the lay.
6. When laying indirect three or more aiming points should be selected to the rear and on either flank, if possible, and made known to all concerned.
7. Before beginning the tests at least five targets will be selected in the foreground at varying ranges and angles of sight, and covering a front of about 25 degrees; except in

the case of targets representing guns these should be natural features of the ground. If it be necessary to use dummies they should be placed in positions such as the troops which they represent would naturally occupy on service. A reference point, approximately in the centre of the target zone, will be pointed out to the No. 1 and to the layer; targets will be indicated with reference to this point by means of the clock code.

8. When laying direct on any target (other than a gun target) which extends over a fairly wide frontage, great exactitude in direction will not be required as regards the point originally selected to lay upon, which may be anywhere in that portion of the target opposite to the gun being laid. Any subsequent lay on the same target must, however, be on the same point as the first.

9. The orders for the lay must be given out by the examiner clearly and distinctly, a short pause (about two or three seconds) being made after each separate order, thus: "All guns, 20 degs. right"—pause—"All guns, 15 mins. more right"—pause—"20 degs. 20 mins."

All orders will be acknowledged by the No. 1 and acted on at once. Should the layer at any time be in doubt as to a particular order, he will refer to the No. 1, who may repeat to him any part of the order received. The No. 1 may, in turn, refer to the examiner.

10. After checking a lay, the examiner will elevate the gun about 15 minutes.

11. Layers will be examined in pairs (Nos. 1 and 3); for any incorrect part of a lay marks will be deducted only from the individual making the error.

12. The times allowed for each lay are as follows :—

Test A.			Test B.		
Lay 1. 1' 00"	Lay 2. 0' 20"	Lay 3. 0' 50"	Lay 4. 1' 00"	Lay 5. 0' 30"	Lay 6. 0' 20"

The layer will call out "Ready" as soon as he has finished laying the gun. The time will be taken from the conclusion of the orders for the lay until the word "Ready" from the layer.

13. One mark will be deducted :—

- (i) For every five seconds or fraction of five seconds beyond the time laid down for the particular lay.
- (ii) For each mistake in the manipulation of the sighting gear or in the drill of the layer as laid down.

14. Ten marks will be deducted :—

If the aiming posts are not planted in line.

15. No marks will be given for the lay :—

- (i) If the sight is incorrectly set.
- (ii) When laying indirect, if the gun is not correctly laid for elevation and direction.
- (iii) When laying direct, if the gun is not laid for elevation within 3 minutes or for direction within 5 minutes.
- (iv) If the bubble of the cross level is not wholly visible.

EXAMPLES OF TESTS.

Laying tests.

The examiner sets the elevation indicator at about 20 degs. and the remaining scales at zero.

Test A (indirect).

Orders.	Procedure.
Lay 1.	
"Aiming point,....."	The procedure will be as
"All guns, 90 degs. 10 mins. right."	laid down under "To lay the gun in the line of fire."
	The battery picket and auxiliary aiming point readings will be chalked up after 3 has reported "Ready."
"Aiming posts front."	The procedure will be as laid down under "To plant aiming posts." Time for this part of the lay is not taken.
Lay 2.	
"Charge two."	The procedure will be as
"All guns, 1 deg. 10 mins. more right."	laid down under "To lay the gun."
"25 degs. 40 mins."	
Lay 3.	
"Change target."	The procedure will be as
"Change three."	laid down under "To change target" and "To lay the gun."
"All guns, 2 degs. 15 mins. more left."	
"No. 3, 20 mins. more right."	The target auxiliary aiming point reading will be chalked up after 1 has reported "Ready."
"20 degs. 20 mins."	

Test A (indirect)—cont.

Orders.	Procedure.
Lay 4.	
"Change target."	The procedure will be as
"All guns, 11 degs. 15 mins. right of zero lines."	laid down under "To change target" and "To lay the gun."
"Clinometer laying."	The target auxiliary aiming point reading will be chalked up after 1 has reported "Ready."
"18 degs. 10 mins."	

Test B (direct).

The reference point is described before orders are given.

Orders.	Procedure.
Lay 5.	
"Represent No. 3 gun in action."	The procedure will be as
"Infantry lining hedgerow,"	laid down under "To lay the
4 o'clock, 3 degs. to 5 degs." gun."	
"Open sights."	
"15 degs. 20 mins."	
	The examiner will put on a deflection and note the reading.
Lay 6.	
"All guns, 40 mins. more left."	The gun will be re-laid on
"15 degs. 50 mins."	the same point of the target as in Lay 5.

Fuze setting test.

Orders.	Procedure.
<i>"Fuze 9.3."</i>	The competitor will set the fuzes of six shell at the graduation ordered. Time, 1 min.

CHAPTER IV.—SIGHT TESTS.

The Watkin clinometer and elevation indicator should be tested daily and after prolonged firing. The alignment tests should be carried out as often as possible.

The remaining test (cross levelling gear) should be carried out when required by a qualified artificer. This test is given in the handbook.

Any adjustment to optical instruments must be carried out by a qualified artificer.

Test 1.—To test the Watkin clinometer.

Set the clinometer at zero, place it on the plane and elevate or depress the gun until the bubble is in the centre of its run. Turn the clinometer end for end; if the bubble is still in the centre of its run, the clinometer is in adjustment.

If the bubble is not in the centre, bring it so by means of the drum. One half the reading is the index error of the clinometer.

A correction for this index error must always be applied.

Test 2.—To test and adjust the elevation indicator.

With the longitudinal bubble in the centre of its run, the elevation indicator should read the elevation at which the gun is laid.

Place a shell in the chamber to take up play in the elevating gear.

Lay the gun at 20 degrees elevation with a Watkin clinometer; bring the longitudinal bubble to the centre of its run by the elevation indicator handwheel. The elevation indicator should read 20 degrees.

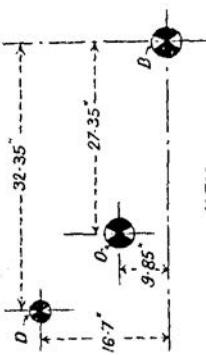
If the elevation indicator does not read 20 degrees, slacken the screws securing the retaining plate, revolve the skin until it reads 20 degrees and re-clamp.

To face page 17.

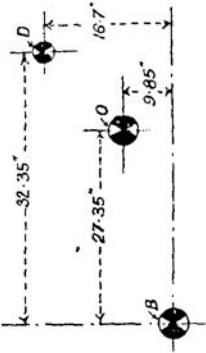
TARGET TESTING SIGHT.

9.2 IN. B.L. HOW. MK.III ON CARRIAGE, SIEGE, MK.II.

FOR USE IN FRONT OF GUN.



FOR USE IN REAR OF GUN.



KEY.

- B.= Bore of Gun.
- O.= Open Sights.
- D.= Dial Sight.

964.

Maths. & Sons Ltd.

Alignment tests.

Before beginning these tests the following preparations should be made :—

- (i) Select a well-defined object at least 1,500 yards distant on which to lay.
- (ii) If this distant object cannot be found, set up the target testing sights (see diagram) about 50 yards • in front (or in rear) of the gun at right angles to the axis of the bore.
- (iii) If the carriage is not level transversely, the top of the dial sight carrier and the target testing sights should be sloped to the same angle as the carriage.
- (iv) Fix cross wires at the muzzle of the gun.
- (v) Set the elevation indicator, the cowl of the dial sight, the dial plate and micrometer scales of the dial sight, and the deflection scale of the open sights at zero.

NOTE.—In practice, tests 3 and 4 are carried out simultaneously.

Test 3.—To test and adjust the dial sight and open sights for line.

The lines of sight through the dial sight and open sights should be parallel to the axis of the bore as regards line.

Lay the bore on the distant object for line by the traversing handwheel, using the intersection of the cross wires as a foresight and the axial vent as a hind sight. The lines of sight through the dial sight and the open sights should be on the distant object. When using the target testing sights,

lay the bore on point B; the dial sight should be on point D and the open sights on point O.

If the dial sight is not in alignment, turn the micrometer heads of the dial sight until the line of sight is correct, slacken the screws securing the reader of the dial plate and the nuts of the micrometers, shift the reader and micrometer scales to zero and re-clamp. If the open sights are not in alignment, turn the eccentric at the front vertical pivot of the rocking bar until the line of sight is correct.

Test 4.—To test and adjust the dial sight and open sights for elevation.

The lines of sight through the dial sight and open sights should be parallel to the axis of the bore as regards elevation when the elevation indicator is at zero.

Lay the bore on the distant object for elevation by the elevating handwheel. The lines of sight through the dial sight and open sights should be on the distant object. When using the target testing sights, lay the bore on point B; the dial sight should be on point D and the open sights on point O.

If the dial sight is not in alignment, revolve the milled head at the top of the sight until the line of sight is correct, slacken the nut securing the micrometer collar, revolve the latter to zero and re-clamp. If the open sights are not in alignment, slacken the clamping nut at the bottom of the foresight, screw the foresight up or down until the line of sight is correct and re-clamp.

NOTE.—After adjusting the micrometer collar of the cowl of the dial sight the arrow on the view finder will not be opposite zero; if confusion is likely to arise this arrow should be erased and a new one scribed opposite the zero mark.

CHAPTER V.—CARE OF EQUIPMENT.

1. CLEANING AND OILING.

Limber gunners should be intelligent and reliable men.

The projections on the exterior of the gun, which form guides for the latter when sliding in the cradle, should be kept clean and oiled and maintained in good working order; all working surfaces should be well lubricated and kept free from paint.

The bore should be kept clean and lightly greased. After firing, it should be scrubbed with caustic soda and hot water (one pound to a gallon), using the piasaba brush. When dry it should be lightly greased with mineral jelly.

No gritty substance, such as sand paper or bath brick, should be used for cleaning working surfaces.

The traversing arc must be kept free from mud and grit and constantly greased with mineral jelly.

The pivot of the limber connector and the two dowels at the front of the bed must be kept clean and well greased, and protected, while the gun is in action, by canvas wrappings.

All spare parts should be used periodically to ensure that they are in working order.

Heads of lubricators should be kept free from paint.

List of lubricators.

Fitting to be lubricated.	No.	Where situated.
Pivot plug	1	Left side of upper pivot block.
Roller ring	25	On circumference of upper pivot block.
Roller cage	6	On top of upper pivot block.
Pivot of limber connector	2	On top of travelling cross-head.
Cradle	11	1 on top of each capsquare for roller bearings. 4 on each side for guideways. 1 on spring stop of elevating arc.
Cut-off gear	3	1 in trunnion collar. 2 in bracket supporting bevel segment spindle.
Traversing gear	5	2 on handwheel spindle gear casing. 1 on worm wheel gear casing. 2 in bearings for worm spindle.
Elevating gear	10	3 on upper gear casing, left side.

List of lubricators—*cont.*

Fittings to be lubricated.	No.	Where situated.
Elevating gear— <i>cont.</i> ...		2 on lower gear casing, left side. 1 on gear casing, right side. 4 in bearings for elevating shaft inside carriage brackets.
Quick elevating gear ...	8	6 on gear casing. 2 in bearings top of arm for cross spindle.
Sighting gear	7	1 in circular collar of arc round trunnion. 2 in supporting bracket. 4 on spindle and cross-shaft of elevation indicator handwheel.
Pump	4	1 on top (automatic). 1 in feed pipe. 1 in each outer bearing of winch handle shaft.
Bearing, breech mechanism lever.	1	On top of carrier.
Safety shutter	1	On top left side of carrier.
Carrier, hinge joint ...	1	On top of hinge pin.
Breech screw and pintle of carrier.	1	On top of breech screw.

List of lubricators (transporting vehicles).

Vehicle.	No.	Where situated.
Wagon transporting gun ...	14	3 in gear casing of traversing gear. 1 in body for sliding surface on axletree. 2 in gear casing of raising gear. 2 in bearings for winch handle shaft of hauling gear. 3 over pivot of fore carriage. 1 in axis of hauling chain wheels front end. 1 in axis of each guide roller.
Limber transporting carriage.	3	On top of lock.
Carriage transporting carriage.	2	1 on each side for brake gear.
Limber transporting bed	3	On top of lock.

2. THE DIAL SIGHT AND CARRIER.

(i.) The No. 7 dial sight.

The dial sight, when issued, is in correct adjustment, water-tight, and with all the cells and joints secured with fixing screws.

It is very unlikely that the interior will require cleaning, and the dial sight must on no account be taken to pieces, except by a person in possession of an Ordnance College certificate stating that he is competent to do so.

The body of the dial sight should be cleaned with a clean soft cloth and a little oil, which must be rubbed off afterwards, care being taken that the glass is not touched. No gritty substance should be used.

The exterior of eye lens and window should be cleaned with a chamois leather specially kept for the purpose. Great care must be taken that no oil or grease is allowed to touch the glasses. Fingers, though apparently clean and dry, leave marks on the lens which will impair the definition of the sight.

When not in use the dial sight in its carrier should be kept in its case.

(ii.) The No. 4 carrier.

If the sight is loose in the bracket it may be due to :—

- (a) The clamping screw head working out of its recess, making it impossible to clamp up. The remedy is to press the head into the recess and clamp.
- (b) The bracket being worn or strained, owing to working the sight about when taking it out of the bracket or over-straining the clamping lever. In this case a clamp to compress the bracket should be fitted

if available ; if not, one side of the bracket should be tapped lightly and evenly with a hammer by an artificer, with the clamping screw loosened.

3. THE BREECH MECHANISM.

(i.) General precautions.

The breech mechanism should be dismantled periodically in order that it may be thoroughly cleaned.

The threads of the breech screw should be free from burrs. Should the screw not work easily when the obturator has been detached, the defect may often be remedied by careful filing by an artificer, but no portion of the thread should be cut away to remove a crack.

The breech should be kept covered up when possible to prevent dust and grit getting into the breech fittings. A cover is provided for this purpose.

The obturating pad should be examined to see that the canvas covering is intact and in working order. If the canvas cover is found to be loose or to overlap either of the protecting discs, the obturator should be changed.

The spare pad should be kept under compression in the box obturator.

The protecting discs should be carefully examined and should be replaced if the steel rings are eroded, burred or cracked.

When fitting the pad and discs on the axial vent, care must be taken that they are assembled in the correct order. The face of the pad marked "front" should be towards the muzzle. One or more steel adjusting discs may be required between the obturator and the face of the breech screw when

the pad is compressed by firing, but the obturator should always turn freely.

The obturating pad should be a close fit in the coned seating of the chamber when the breech is closed. To ascertain this, lightly cover the seating with a mixture of oil and tallow; close and open the breech; the outer end of the pad should be covered with grease from contact with the greased seating of the chamber. If it is found that the pad does not fit the seating closely, adjusting discs should be added until the breech closes with some difficulty. The breech should then be opened and closed until it works easily. Before use, the pad and disc should be well covered with tallow.

Every opportunity should be taken to keep the obturator and axial vent cool. This can be done by pouring water over it in position, or by sousing it thoroughly with a sponge cloth during or after firing.

The obturator should never be dismantled when hot.

When a new pad is fitted it must be expanded with a full charge.

(ii.) To dismantle the breech mechanism.

Before removing the mechanism the breech must be opened and the breech mechanism swung into the loading position.

Vent T axial and obturator :—Remove the keep pin from the pin retaining axial vent nut and withdraw the latter clear of the recesses in the axial vent nut. Unscrew the axial vent nut and remove it to the rear. Remove the spring vent axial. Withdraw the axial vent and obturator from the front end of the breech screw.

Breech screw :—Insert a screwdriver in the slot of the pin actuating retaining plate, press in the pin and partially

revolve it by means of the screwdriver until the indicating arrow on the pin corresponds with the middle of the word "dismantle" on the breech screw. Withdraw the breech screw from the front end of the carrier.

Roller :—Remove the keep pin and roller axis pin, and withdraw the roller.

Lever breech mechanism :—Remove the keep pin and nut from the crankshaft and withdraw the breech mechanism lever.

Lever breech mechanism bearing, crankshaft and cross-head :—Remove the keep pin and securing screw of the breech mechanism lever bearing. Withdraw the bearing and crankshaft from the carrier. At the same time remove the crosshead from the inner end of the crankshaft from inside the carrier.

Carrier :—Remove the split pin from the hinge bolt and withdraw the hinge bolt from the top. Remove the carrier and bearing washer.

(iii.) To assemble the breech mechanism.

The breech mechanism is assembled in the reverse order.

(iv.) To dismantle the lock P.H. and slide box V.

To remove the lock and slide box :—Open the lock. Remove the screw securing slide box. Unscrew the lock and slide box from the stem of the axial vent.

To remove the lock from the slide box :—Remove the axis pin of the extractor. Press down the knob of the plunger retaining cap until it is vertical and remove the lock and extractor from the slide box.

To dismantle or change the striker :—Remove the lock from the slide box. Unscrew the lever actuating lock with

striker complete (left-handed thread). Remove the split pin of the striker cap and withdraw the cap. Withdraw the striker complete from the lever actuating lock. Unscrew the nut striker. Withdraw the rebound collar, mainspring and collar mainspring from the striker.

To dismantle the actuating lever:—Remove the split pin. Remove the pin guide retaining catch. Withdraw the plunger and spring.

(v.) To assemble the lock P.H. and slide box V.

The lock and slide box are assembled in the reverse order.

4. RECUPERATOR AND BUFFER.

General precautions.

(i.) Before firing.

Care should be taken to see that the recuperator and buffer are correctly charged, that there is no leakage at the stuffing boxes, that the buffer cylinder is firmly nutted up to the lug of the gun and the piston rod to the front of the cradle, that the recuperator cotter is in position, that the cut-off gear is in adjustment and that no split pins are missing.

It is necessary to strain the oil before charging the recuperator or buffer.

During severe weather, recuperators and buffers should be protected as much as possible from the cold.

Recuperator and buffer cylinders should be washed out with paraffin or hot water to remove grit as opportunities offer.

(ii.) In action.

Fault.	Cause.	Remedy.
Incorrect length of recoil.	Cut-off gear out of adjustment.	Adjust by the sleeve.
Gun fails to run out.	Loss of pressure ...	Replenish liquid or air.
Gun runs out sluggishly.	Loss of pressure ... Excessive friction in the guides. Excessive friction in the stuffing boxes.	Replenish liquid or air. Clean and lubricate. Relpack the stuffing boxes.
	Bent piston rod or recuperator ram.	Replace or straighten the bent rod.

(iii.) When guns are resting in action.

Cool the bore. Allow air to escape from the buffer by the air release valve. Replenish the buffer if necessary. Tighten packings if necessary. Test the air pressure after the gun has cooled.

5. THE RECUPERATOR.

(i.) General precautions.

Before removing the recuperator cotter the apparatus securing the recuperator ram must be fixed.

The gun must never be fired if the amount of leakage indicated by the tail rod exceeds 8 pints, or if the air pressure is below 350 lbs. a sq. in.

(ii.) To charge the recuperator with liquid.

Secure the gun to the cradle by the buffer locking pin and elevate the gun about 5 degrees. Discharge any air pressure in the air cylinder by removing the closing plug and opening the by-pass valve. Push the tail rod into the air cylinder as far as it will go. Remove the filling and air hole plugs.

Pour oil through a funnel into the filling hole until it overflows at the air hole. Replace the plugs.

About 32 pints of oil are required to fill the recuperator.

(iii.) To charge the recuperator with air.

Secure the gun to the cradle by the buffer locking pin and elevate the gun about 5 degrees. Remove the closing plug and connect up the pressure gauge and air pump.

Slacken the locking nut, open the by-pass valve and pump until the gauge registers 500 lbs. per sq. in.

Slacken the filling plug one turn and allow liquid to escape until the tail rod indicator reads zero. Screw up the filling hole plug.

Close the by-pass valve, disconnect the pipe from the adapter and place the cap on the adapter. Let the pressure down slowly to 475 lbs. per sq. in. by opening the by-pass valve slightly and slackening back the cap on the adapter.

When the pressure reads 475 lbs., close the by-pass valve, tighten the locking nut, remove the adapter with pressure gauge and replace the closing plug.

(iv.) To test the air pressure.

Remove the closing plug and attach the adapter and pressure gauge. Blank the outer end of the adapter with the

cap. Slacken the locking nut, open the by-pass valve and the gauge should register between 350 and 475 lbs. per sq. in.

If the pressure is correct, close the by-pass valve, tighten the locking nut, remove the adapter and gauge and replace the closing plug. If the pressure is below 350 lbs., close the by-pass valve, connect up the air pump and make up the pressure to 475 lbs.

(v.) To replenish air pressure lost by leakage.

Proceed as for charging the recuperator with air, but, before opening the by-pass valve to admit air to the recuperator, pump the pressure in the pipe up to 475 lbs. per sq. in.

(vi.) To empty the recuperator.

Secure the gun to the cradle and elevate about 5 degrees.

Remove the air hole plug and the drain plug, and allow the liquid to run out into a suitable vessel.

Discharge the air pressure by removing the closing plug and opening the by-pass valve.

(vii.) To replace the tail rod packing.

Secure the gun to the cradle and empty the recuperator. Unpin and remove the indicator tube from the crosshead, and remove the stop plate from the front end of the tail rod. Unscrew the gland and remove the packing with its supporting rings. Unscrew the protecting ring and remove the U washers with their supporting rings. Renew the defective rubber or packing and replace the gland, packings and rings, taking care that the packings are not damaged. Replace the stop plate and indicator tube, and re-charge the recuperator.

(viii.) To replace the ram packing.

Secure the gun to the cradle and empty the recuperator. Unpin and remove the indicator tube. Disconnect the ram from the crosshead and force it into the air cylinder. Remove

and renew the packings as described in section 5 (vii). Draw the ram to the front and connect it to the crosshead, replace the indicator tube, and re-charge the recuperator.

(ix.) To renew the rubber packings on the head of the floating piston.

Secure the gun to the cradle and empty the recuperator. Unpin and remove the indicator tube and crosshead, and dismantle the tail rod gland and ram gland. Remove the ram and floating piston to the front. Unscrew the collars securing the rubbers on the floating piston and remove them with their supporting rings. Renew the defective rubber and replace the rubbers, supporting rings and screwed collars. Replace the floating piston and ram in the air cylinder. Replace the ram gland and crosshead and connect the ram to the crosshead. Replace the tail rod gland and indicator tube, and re-charge the recuperator.

6. THE BUFFER.

(i.) To fill the buffer.

Remove the air and filling hole plugs in the top of the tank and elevate the gun about 5 degrees. Press in the air release valve and pour oil into the tank until it overflows at the air release valve. Release the valve, fill the tank, and replace the air and filling hole plugs.

About 12 gallons of oil are required to fill the buffer and tank.

(ii.) To empty the buffer.

Elevate the gun about 5 degrees. Remove the air hole plug of the tank and the drain plug of the buffer cylinder, and run the oil off.

If it is desired to empty the buffer completely, the gun is depressed and the stuffing box removed.

(iii.) To tighten the gland.

Lay the gun horizontal. Disengage the locking plunger and tighten the outer gland by means of the spanner provided. Re-engage the locking plunger.

The gland should not be over-tightened as this may cause seizure.

(iv.) To renew the packing in the buffer gland.

Empty the buffer and elevate the gun about 5 degrees. Disconnect the piston rod from the front bracket and the actuating gear from the piston rod. Unbolt and remove the front bracket and remove the securing collar from the piston rod. Disengage the locking plunger. Unscrew and remove the outer gland, supporting rings and packing. Unscrew and remove the inner gland and L rubber. Renew the defective rubber or packing and replace the glands, packings and rings, taking care that the packings are not damaged in passing over the screw threads of the piston rod. Re-assemble the securing collar bracket and actuating gear, and refill the buffer.

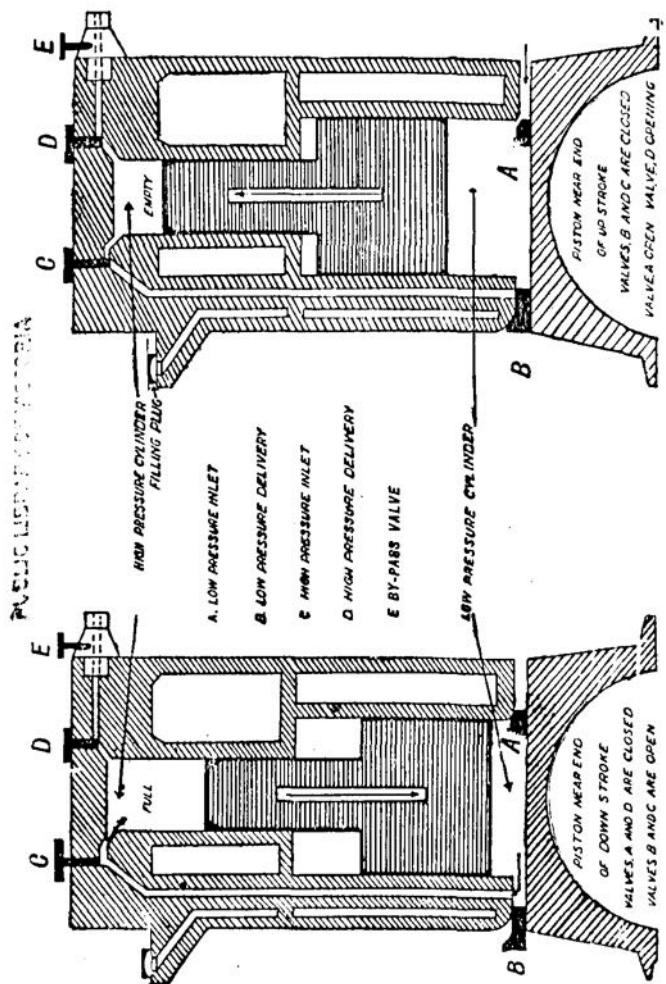
(v.) To renew the L washer in the stuffing box.

Proceed as in section 6 (iv); after removing the glands, remove the locking plate and unscrew the stuffing box, together with the defective packing and supporting ring. Renew the packing. Replace the supporting ring, packing and stuffing box. Re-assemble and refill the buffer.

7. THE AIR PUMP.

A dust cover is provided with the pump. The cover must be kept on when the pump is not in use.

The water jacket must be kept filled when the pump is in action. In cold weather empty the jacket immediately



after action and close valve A to prevent dirt and grit entering the cylinder when standing. Open again when putting the pump into action and set the sight feed lubricator to give eight drips per minute.

Before charging the recuperator it is advisable to test the pump system as follows:—Close the air charging valve of the recuperator. Work the pump slowly until the gauge registers 500 lbs. per sq. in. If the system is in good working order the gauge hand should remain stationary, or only creep back very slowly. Should the hand fall back quickly the system should be examined for external faults. Faults may be located by smearing wheel grease over the joints; air bubbles will be observed where there is a leak.

Great care should be exercised in using the gauge. When taking or releasing pressure the valve should be opened gently in order to prevent damage to the gauge.

If the pump only gives 20 lbs. pressure, valves B and C are faulty. If the pump only gives 200 lbs. pressure valve D is faulty. If no air is delivered valve A is faulty. If the valves are proved to be in order, look to the packing rings of the piston. In the event of valve D going out of order, and no spares being available, replace it with valve B; valve C should not be used for this purpose.

If necessary the valves should be lightly ground in and coated with thin oil.

APPENDIX.

WEIGHTS AND DIMENSIONS OF LOADS.

1. The bed.

		tons.	cwts.	qrs.	lbs.
Bed	...	3	1	3	15
Carriage transporting	...	0	11	2	21
1 draught link	...	0	0	2	8
2 lifting screws	...	0	0	3	2
Limber transporting	...	0	17	3	22
1 lifting screw	...	0	0	1	5
Total	...	4	13	0	17
Earth box	...	0	19	0	3
Derrick	...	0	2	0	16
Platforms	...	0	2	0	27
Total weight travelling	...	5	16	2	7
Weight on front axle	...	2	13	3	7
Weight on rear axle...	...	3	2	3	6
Measurement tonnage	...	23	10	0	0
Total length without connector	...	...	...	20 ft. 9 ins.	
Total length with connector	...	...	...	23 ft. 1 in.	
Greatest height (top of wheels)	...	...	...	5 ft.	
Greatest width (ends of axles)	...	...	...	9 ft. 1 in.	
Wheel base	...	...	...	14 ft. 6 ins.	
Wheel track	...	...	...	8 ft.	
Angle of lock, right	39 degrees.	
Angle of lock, left	40 degrees.	
Turning circle (diameter)	54 ft.	

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2. The carriage.

	tons.	cwts.	qrs.	lbs.
Carriage	4	19	3	14
Carriage transporting	0	15	1	14
Limber transporting	0	16	0	8
2 lifting screws	0	0	2	13
Total weight travelling ...	6	11	3	21
Weight on front axle	2	8	3	14
Weight on rear axle... ...	4	3	0	7
Measurement tonnage	41	0	0	0
Total length without connector ... ...	...	...	19 ft. 8 ins.	
Total length with connector ... ...	...	...	21 ft. 11 ins.	
Greatest height (top of gravity tank) ... ...	...	...	9 ft. 3 ins.	
Greatest width (ends of axles) ... ...	...	...	9 ft. 1 in.	
Wheel base ... ... ...	...	...	10 ft. 9 ins.	
Wheel track ... ... ...	...	...	8 ft.	
Angle of lock, right ... ...	...	...	30 deg. 30 min.	
Angle of lock, left ... ...	...	...	36 deg. 15 min.	
Turning circle (diameter) ... ...	...	...	25 ft.	

3. The gun.

	tons.	cwts.	qrs.	lbs.
Gun with breech fittings	4	5	0	17
Wagon transporting	2	6	0	17
Total weight travelling ...	6	11	1	6
Weight on front axle	2	15	2	6
Weight on rear axle... ...	3	15	3	0
Measurement tonnage	26	12	0	0
Total length without connector ... ...	...	...	16 ft. 6 ins.	
Total length with connector ... ...	...	...	19 ft. 3 ins.	
Greatest height (top of gun lug) ... ...	...	...	7 ft. 2 ins.	
Greatest width (ends of axles) ... ...	...	...	9 ft. 1 in.	
Wheel base ... ... ...	...	...	8 ft.	
Wheel track ... ... ...	...	...	8 ft.	
Angle of lock ... ...	...	...	37 degrees.	
Turning circle (diameter) ... ...	...	...	35 ft.	

The diameter of the turning circle of the three vehicles en train is 54 ft.

4. The holdfast platform.

			tons.	owts.	qrs.	lbs.
2 diagonal beams	...	...	0	2	10	4
2 longitudinal beams	...	...	1	18	2	0
1 cross beam	...	...	0	11	2	7
1 skid, cross beam	...	...	0	3	0	14
2 diagonal stays	...	...	0	0	3	3
15 planks	...	...	0	10	2	4
2 wheel guides	...	...	0	4	3	2
8 pegs securing bed	...	...	0	6	3	24
Bolts, &c.	...	...	0	0	3	16
Total	...	...	4	1	2	18
Diagonal beams, each	...	...	14 ft.	x 12 in.	x 12 in.	
Longitudinal beams, each	...	...	10 ft.	7 in.	x 10 in.	x 11 in.
Cross beam	...	...	14 ft.	6 in.	x 16½ in.	x 10½ in.
Skid, cross beam	8 ft.	x 12 in.	x 12 in.	
Planks, each	10 ft.	7 in.	x 10 in.	x 3 in.
Wheel guides	11 ft.	10 in.	x 11½ in.	x 2½ in.

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